A Dissertation on

SIGMOID VOLVULUS
PRESENTATION AND MANAGEMENT

Dissertation submitted to

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

With fulfillment of the regulations
For the award of the degree of
M.S. (General Surgery)
Branch – I

DEPARTMENT OF GENERAL SURGERY
KILPAUK MEDICAL COLLEGE

CHENNAI – 600 010.

MARCH - 2009

CERTIFICATE

Certified that this dissertation is the bonafide work of **Dr. R. SARAVANAN** on **"SIGMOID VOLVULUS - PRESENTATION AND MANAGEMENT"** during his **M.S. (General Surgery)** course from June 2006 to March 2009 at **THE GOVERNMENT KILPAUK MEDICAL COLLEGE HOSPITAL AND GOVERNMENT ROYAPETTAH HOSPITAL, CHENNAI.**

PROF.DR.G.GUNASEELAN M.S.,
Head of the Department
Department of General Surgery
Government Kilpauk Medical College
Chennai – 600010

PROF. DR. P.RAVI.M.S.,
Professor of surgery
Department of General Surgery
Government Kilpauk Medical college
Chennai– 600010

PROF. DR. M.DHANAPAL M.D., D.M.,
Dean
Government Kilpauk Medical College and Hospital
Kilpauk, Chennai – 600010.

ACKNOWLEDGEMENT

I am greatly indebted to **Prof.P.RAVI, M.S., and DR.MR.ALAGAPPAN. MS., Mch.,** for their valuable guidance and contribution in completing this study.

I am grateful to **THE DEAN,** Kilpauk Medical College and **Prof. G. GUNASEELAN, M.S.,** Head of the Department of General Surgery for permitting me to utilize the clinical material in Kilpauk Medical College Hospital and Government Royapettah Hospital, Chennai, during the period of my study.

I wish to thank **Prof. K. RAJENDRAN, M. D.,** Superinitendent, Government Royapettah Hospital, for his guidance and help to do this work.

I am thankful to my Assistant Professors **DR. T. RAGUPATHY M.S., DR.R.MATHIVADHANAM M.S., Dr.R.RAVI Mch** and **DR. P. THANGAMANI, M. S.,** for clarifying all my doubts and for putting forth all their efforts to make this study a complete one.

Lastly, I thank **MY PATIENT** not only for their consent and co-operation towards the preparation of this study but also for the privilege of practicing our craft.

INTRODUCTION

Volvulus describes a condition in which a segment of bowel becomes twisted on its own mesenteric axis resulting in complete or partial obstruction. Compromised blood supply along with increase in intraluminal pressure leads to gangrene and perforation if unrelieved.

Volvulus is generally uncommon and the colon is the most common part of GIT to form a volvulus. The most frequent site is the sigmoid colon. The other sites include caecum, ascending colon and transverse colon.

In the vast majority of cases, sigmoid volvulus is an acquired condition resulting from elongation of sigmoid loop and stretching of sigmoid mesocolon. Detailed records of this disease were found in the Egyptian papyrus ebers and in ancient Greek and Roman writings. Insufflations with air to untwist the sigmoid volvulus as a mode of treatment, which Hippocrates had advocated, are still the basis for the non-operative treatment of sigmoid volvulus accepted by surgeons worldwide.

In the developed world, sigmoid volvulus occurs in elderly and frail patients with illness. Therefore, initial treatment in the absence of clinical features of large bowel gangrene or peritonitis, consists of detorsion by sigmoidoscopy and transrectal intubation as described by BRUDSGAARD.

Failure to achieve detorsion, clinical evidence or suspicion of perforation requires emergency laparotomy. At laparotomy, various operative procedures have been adopted in the emergency management of
sigmoid volvulus. However permanent cure can only be ensured by resection of the sigmoid colon and anastamosis.

In the developing world, mortality following emergency surgery for acute sigmoid volvulus is low. This is mainly due to the fact that patients are relatively young and healthy and therefore, better able to recover from the disorder and its surgical treatment. Hence a single staged method of treatment that ensures a permanent cure, avoids a colostomy, reduces number of procedure and associated mortality and morbidity and shortens duration of hospital stay is desirable.

Clinical and experimental evidence supports the view that a clean bowel is an important factor in surgery of the left colon and rectum, those parts of the bowel, which normally have solid feces and a high bacterial count. So, a definitive one-stage resection of the redundant colon and primary anastamosis after on-table ante grade colonic lavage as described by DUDLEY. et. al is preferred.

AIM OF THE STUDY

1. To analyse the mode of presentation of sigmoid volvulus.

2. To alalyse the various options available for management of sigmoid volvulus.

3. To analyse the outcome ie morbidity and mortality of the various Procedures for sigmoid volvulus.

REVIEW OF LITERATURE

INCIDENCE

Sigmoid volvulus has variable racial and geographical distribution. The incidence of volvulus as a cause for large bowel obstruction varies between 2% and 5% in Western Europe and North America. Elsewhere, especially Africa, Eastern Europe and Asia it accounts for approximately 50% of all forms of mechanical obstruction.

Sigmoid colon is the most common part of the large intestine to undergo volvulus. Ballantyne in a collected series of 546 episodes of volvulus in the USA found the following proportions: caecum 34.5%, transverse colon 3.6%, splenic flexure 1% and sigmoid colon 60.9%.

In a collected worldwide series of 1845 episodes of colonic volvulus, Jain and Seth found that sigmoid volvulus accounted for 76.2% of all cases.

Sigmoid volvulus has a definite age and sex predilection. In a review by Ballantyne, sigmoid volvulus was more in men 63.7% of 571 patients, the lower incidence in women being attributed to a wider pelvis. In western cultures, volvulus is a disease of the sixth decade but occurs 15-20 years earlier in developing nations. A racial trend was also noted, with 67% of patients being black and 33% being white

ETIOLOGY

In the west, sigmoid volvulus occurs as a result of sigmoid elongation, resulting in a redundant loop. This is seen most commonly as a result of long-term neurological or psychiatric disease. Associations with Parkinson's disease, multiple sclerosis and spinal cord patients are well known. Psychotropic drugs or sedatives interfere with colonic motility and are etiologically implicated in the high incidence seen in psychiatric institutes. The high incidence in nursing homes and mental institutions led RONKA et al to describe the condition as the "BEDFORD SYNDROME ".

A second major etiological factor is the excessive use of laxatives, cathartics and enemas. Naturally, this may merely represent another manifestation of chronic constipation and prolonged recumbency seen in chronic care facilities. In developing countries, a high fibre diet results in overloading of sigmoid colon that twists around its mesentery resulting in volvulus.

Rarer conditions predisposing to volvulus include Chagas disease and Hirchsprung's disease both of these conditions result in destruction of the myenteric plexus and culminate in megacolon .A pelvic mass may displace the sigmoid colon sufficient to cause it to twist. This explains the association of sigmoid volvulus with pregnancy and massive ovarian tumours.

Rarely, an elongated mesocolon may provide excess mobility to the sigmoid colon. This may be a result of abnormal congenital fixation. An interesting association between volvulus of the stomach, splenic flexure of colon and sigmoid colon has been described .the later association is referred to as “Traverling volvulus”. This association probably reflects an uncommon elongation of the mesenteric fixation of intraperitoneal organs.

Classically, sigmoid volvulus is described as occurring in an anti clockwise direction. Rotation is found to be 360° in 50 % of cases, 540° in 15% of cases, 180° in 35% of cases.

Volvulus of sigmoid colon occurs in the face of three conditions,

Elongation of the sigmoid colon

1. Narrowing of the base of sigmoid mesocolon
2. A torque force to the sigmoid colon, which initiates the torque process

The base of the sigmoid mesocolon becomes foreshortened as a result of repeated episodes of torsion. Many of these episodes are sub acute and self-limiting and the patients never seek medical attention. Over 50% of patients presenting with volvulus give a history of previous episodes .As a result of foreshortening of the mesocolon, the narrow base acts as a fulcrum about which sigmoid colon may twist .In addition, adhesive bands develop between the two limbs of the sigmoid, creating a paddle like configuration. This chronic “mesosigmoiditis ” is visible in the root of the sigmoid mesentery in most patients in whom a sigmoid volvulus occurs.

Chronic constipation in western cultures results in an overloaded sigmoid loop whose weight provides the momentum to initiate volvulus. In African and Middle Eastern societies, a high fibre diet results in a bulky sigmoid colon that provides the necessary impetus.

PATHOPHYSIOLOGY

Complete volvulus requires the torsion of the intestine to be more than 180 degrees, which is then followed by actual torsion of the bowel (Groth, 1934) in which the blood supply to the colon becomes compromised to the point of infarction. The endotoxin produced by the action of a higher number of anaerobic bacterias on the infarcted tissue then gradually crosses the colonic wall out into the abdominal cavity, and through the highly permeable peritoneal membrane it is disseminated into the general circulation. Further spread of the toxin also occurs and there is massive fecal soiling during either resection and anastomosis or Hartmann's procedure. These increasing levels of toxin gradually impair cardiac function leading to decreased cardiac output. Vasodialation and increased permeability later cause pooling and leakage of fluid in the interstitial space leading to further decrease in cardiac output and septic shock.

In a study conducted by Polivka, three decades ago, sigmoid volvulus represented 5% of all intestinal obstructions treated from July 1964 until July 1965. High frequencies were also reported from countries in Africa, Asia, Latin America and Eastern Europe; but the highest incidence of SV on record was in La Paz, Bolivia- 79% of all intestinal obstructions. The main contributing factor in those parts of the world where there is an increased incidence of sigmoid volvulus, is the high dietary fiber and gas formation resulting from the

fermentation of carbohydrate in the colon(Morris et al., 1960). In the United States and Western European countries, the frequencies still remain 1 – 3 percent of all bowel obstructions (Boggs et al., 1960), and those commonly affected are elderly patients suffering from psychiatric and chronic neurological diseases, such as stroke or multiple sclerosis, the medicament for which cause recurrent constipation. Cardiovascular diseases and diabetes are also associated with it (Morris et al., 1994).

One important fact in the epidemiology of the disease which still requires satisfactory explanation is the difference that exists among the sexes. While male preponderance is observed in some African, Asian and Latin American countries, there was no marked variation in the male/female ratio in some Western countries such as United States and Great Britain (Anderson, 1981, Khoury, 1977). Attempts were made to demonstrate the role of genetics with respect to sigmoid volvulus but lacked adequate convincing evidence (EL Masri et al., 1987). However, a large pelvis and soft abdominal musculature in females is believed to reduce the prevalence of sigmoid volvulus quite markedly for it provides better mobility to the sigmoid loop (Bruusgaard, 1947). However, this argument fails to explain the reason why there is less significant difference in male/female ratio to sigmoid volvulus prevalence in western societies. Similarly, even though high fibre diet is believed to increase the incidence of sigmoid volvulus in Africa and Asia (Shepherdet al., 1969), it is found to be less frequent in women in countries here men and women share the same diet.

CLINICAL FEATURES

Sigmoid volvulus may present as acute or subacute intestinal obstruction and may be clinically indistinguishable from obstruction due to carcinoma of the distal colon.

ACUTE FORM:

Symptoms

1. Sudden onset of severe abdominal pain
2. Abdominal distension
3. Vomiting
4. Absolute constipation

Signs

1. The patient is toxic and has tachycardia

2. Abdominal distension more pronounced than other causes of intestinal obstruction.

3. Generalized abdominal tenderness and guarding.

4. Tinkling bowel sounds can be heard initially but they vanish with either secondary ilieus or perforation.

5. Digial rectal examination reveals an empty distended rectum and there may be blood on the glove if gangrenous changes have set in.

Sigmoid volvulus may be complicated by infarction and impending perforation. Hence the surgeon should always be alert to this complication as evidenced by

a. Rebound tenderness

b. Absent bowel sounds

c. Rising pulse rate with or without pyrexia

There may be a previous history of acute volvulus, which spontaneously resolved with passage of copious amounts of flatus and liquid feces.

In sub acute intestinal obstruction, abdominal distension is the major symptom and sign and there is minimal abdominal tenderness.

INVESTIGATION

I. PLAIN ABDOMINAL RADIOGRAPHS

The classic appearance is of a dilated loop of bowel running diagonally across the abdomen from right to left with two fluid level seen, one within each loop of bowel. Gas is usually absent from rectum.

The descriptions given for the radiographic appearance include

a. Coffee bean appearance

b. Ace of spade appearance

c. Omega loop appearance

In late cases, peritoneal fluid is indicated by ground glass appearance and there may be progressive distension of small intestine with gas and fluid.

The plain abdominal radiographs were found to be 60-90% accurate in diagnosing sigmoid volvulus.

PLAIN ABDOMINAL RADIOGRAPH

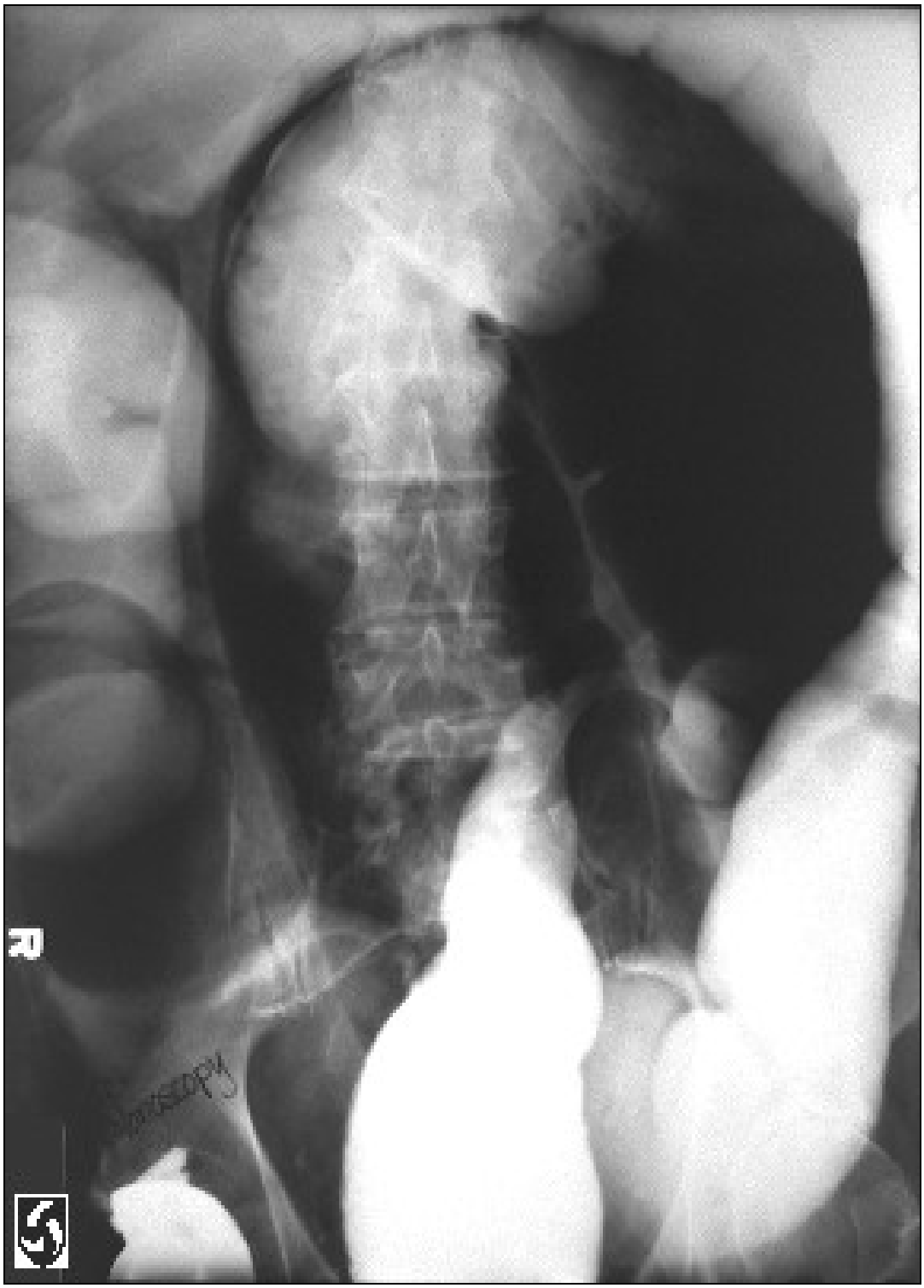
II. CONTRAST ABDOMINAL RADIOGRAPHS:

Barium enema or gastrograffin enema is done when the patient presents with sub acute intestinal obstruction.

Findings include

1. Dilated distended sigmoid loop

2. Tapering of the recto sigmoid lumen into a “bird’s beak deformity” indicating the lower end of the torsion.


20

BARIUM ENEMA

III. COMPUTED TOMOGRAPHY

1. CT findings of sigmoid volvulus include the whirl sign, which represents tension on the tightly twisted mesocolon by the afferent and efferent limbs of the dilated colon.
2. CT may be useful in identifying the etiology and site of obstruction resulting from other pathologies and also in demonstrating ischemia resulting from strangulation.
3. CT signs of ischemia include a serrated beak at the site of obstruction, mesenteric edema or engrossment, and moderate to severe thickening of the bowel wall.
4. Intramural gas or portal venous gas may be seen (grave prognostic signs), and in patients in whom a perforation has occurred, a large amount of free intraperitoneal gas or fluid may be noted.

Degree of Confidence: CT is the least non- invasive imaging technique that allows assessment of mural ischemia. CT helps in identifying the cause of an acute large bowel obstruction in 74-86% of cases, although the specificity of the investigation is low.

False Positives/Negatives: False findings may involve other forms of volvulus or obstruction and causes of large bowel ischemia.

IV. SIGMOIDOSCOPY

1. Sigmoidoscopy can be used both as a diagnostic and therapeutic manoeuvre.

2. Rigid or flexible sigmoidoscope can be used

3. The site of torsion can be seen as an edematous area through which it is impossible or extremely difficult to negotiate the scope.

4. If gentle onward movement and rotation obtain a sudden gush of flatus or fluid and instrument enters an extremely dilated segment of proximal colon, the diagnosis can be confidently confirmed.

5. Sigmoidoscopy also rules out the presence of an intrinsic lesion within the wall of the colon causing obstruction.

6. Signs of gangrene at sigmoidoscopy include devitalized mucosa following reduction and blood stained effluent from the sigmoidoscope or rectal tube.

TREATMENT

RESUSCITATION

The priority is resuscitation of the patient. Vomiting and third space fluid loss into the sigmoid colon results in hypovolemic shock which must be corrected with intravenous balanced salt solutions such as Ringer's Lactate. Fluid resuscitation should be initiated before any attempts are made to reduce the volvulus. In the event of perforation, the patient should be more adequately perfused and any further delay to optimize the patient's general condition before surgery should be minimized.

Hypovolemic shock may be compounded by sepsis in the presence of ischemic bowel. For the same reasons given above, broad spectrum antibiotics (aerobic and anaerobic) should be given. The patient is laid in the left lateral position to improve venous return which may be compromised as a result of massive abdominal distension. Oxygen is given, since splinting of the diaphragm impedes respiratory efforts and results in "shunting" of blood through the pulmonary circulation. A Foley catheter is inserted to assess fluid balance and a nasogastric tube should be placed if vomiting is a prominent symptom or X-ray reveals significant small bowel obstruction.

RATIONALE OF DEFINITIVE TREATMENT

The treatment of sigmoid volvulus has evolved over the past decades from one requiring immediate surgical correction, which carries a high mortality, to one of immediate sigmoidoscope reduction and elective surgery

with its attendant lower mortality. Even from the time of Hippocrates, reduction of the volvulus was attempted using a long suppository “10 digits long”into the rectum. This mode of deflating the volvulus was suggested again in 1859 by Gay in England, but did not gain widespread acceptance until the middle of the next century. In the latter part of the 20th century, percutaneous deflation of the loop using trocars was described by Crisp, who performed his studies in cadavers. Open reduction of the volvulus at laparotomy was first described by Atherton qi 1883, although recurrence rates were high and fixation or resections of the sigmoid were attempted. Emergency resection carried a mortality rate of well over 50% and sigmoidopexy was found to have a high rate of recurrence. The failure of sigmoidopexy was illustrated during re-exploration of the abdomen for recurrent volvulus, which often revealed little evidence of the attempted fixation. In 1947 Bruusgaard revived the technique of transanal deflation using sigmoidoscopy. By providing the means of averting the high mortalities incurred by urgent laparotomy, it was with relief that sigmoidoscopic decompression gained widespread acceptance. More recently the use of flexible sigmoidoscope or colonoscope provies a further weapon in the armamentarium of the surgeon attempting nonoperative reduction of the sigmoid loop.

After successful endoscopic deflation, the question then arises, whether or not subsequent surgery is required. Simple deflation, without operative fixation or resection is followed by subsequent episodes of volvulus in over half

the patients, with its own attendant complications and mortality. Elective resection, during the same hospital stay is advocated by Bak, ho cites a 6% operative mortality, compared to a mortality of 30%from recurrent episodes of volvulus.

These statistics are disputed by Arnold et al, ho cite an operative mortality of 15% from resection after the first episode, yet a lower mortality (9%) from recurrent episodes of volvulus requiring surgery. The authors further stratified their patients according to age (<70, and >70 years of age) and found, not surprisingly, that two thirds of the deaths occurred in the older population. They concluded that resection should be performed after the first episode only in patients under 70 years of age and in patients older than 70, resection should be deferred until the second or subsequent episode.

The lower operative mortalities for recurrent episodes were attributed to an increase in the blood supply as a result of recurrent episodes of volvulus.

The experience of Arnold et el can be interpreted another way. The elderly (>70 years old) debilitated patient may not live long enough to develop another episode of volvulus, and this subgroup remove themselves from the equation. Yet the less debilitated septuagenarians may survive long enough to experience one or many further episodes. If resection is performed only in this healthier subgroup, the operative mortality will naturally be lower. Candidates for elective resection should therefore be selected not only on basis of greater or less than 70 years of age, but on the usual cardio-respiratory and metabolic

criteria which determine fitness for surgery. It is very unlikely that patients above the age of 70 in reasonable health ill benefit from recurrent episodes of volvulus, not to mention the humanitarian and financial burden placed on them from repeated admissions to hospital. In addition, it is difficult to define a “first” episode of volvulus, since many patients (circa 50%) give a history of similar, self resolving episodes in the past.

In the past 2 years, another historic treatment for sigmoid volvulus has gain popularity, with the renewed description of percutaneous deflation of the sigmoid loop by saline. The authors describe a 100% success rate using percutaneous deflation of the sigmoid loop, followed by peranal intubations and elective band sigmoidopexy. This regime as attended by 0% mortality, compared with 13% morbidity and 13%mortality with conventional sigmoidoscopic reduction and elective sigmoid resection.

The laparoscopic surgery provides another dimension to the evolving treatment of sigmoid volvulus. Although laparoscopic intervention, may not play a role in reduction of the acute volvulus, its use in elective resection of the redundant sigmoid loop may be facilitated by anatomic considerations. The base of the mesocolon is foreshortened and contracted, so facilitating its mobilization and division. The mobile nature of the sigmoid loop itself may also facilitate its mobilization and reduce the risk of damage to adjacent structures. Lastly, the close apposition of the proximal rectum and distal colon (as a result of the shortened mesosigmoid) may facilitate the performance of a stapled end to end anastomosis.

MANAGEMENT

CONSERVATIVE MANAGEMENT

The management of sigmoid volvulus involves relief of obstruction and prevention of recurrent attacks.

SIGMOIDOSCOPY

Sigmoidoscopy as the initial treatment was first described by Brudsgard in 1947 and it is now the procedure of choice in patients with viable bowel.

Sudden decompression is made using either rigid or flexible sigmoidoscopy or colonoscopy. The site of torsion is frequently encountered approximately 15 cm above the anal verge and within reach of the rigid sigmoidoscope. When the twist is beyond this point, a flexible sigmoidoscopy or colonoscopy is used to improve decompression rate. Colonoscopic decompression has the further advantage of effecting extirpation of the contents from the proximal distended colon providing rapid resolution of patient's pain. They are successful in 70-90% of cases.

After decompression, a well-lubricated large bore gastric decompression tube (32) is advanced through the lumen of the scope into the dilated colonic loop.

The mortality following endoscopic decompression alone is 5-12% and most often results from co-existing conditions. Moreover, the likelihood of recurrence is quite high (30-90%) and accompanied by mortality rate of up to 40%. Therefore most patients treated successfully by endoscopic decompression should undergo mechanical bowel preparation and elective operative treatment during same hospital admission.

To improve the success rate of non-operative treatment of sigmoid volvulus by tube deflation and to avoid emergency surgery Salim. et. al (1991) introduced percutaneous deflation of the sigmoid colon prior to attempting a sigmoidoscopic decompression. This manoeuvre has the potential to introduce contamination and infection in the peritoneal cavity and for these reasons its use is strongly discouraged.

SIGMOIDOSCOPIC REDUCTION

With the patient in the left lateral position, a rigid sigmoidoscope is advanced into the rectum under direct vision, with using adequate illumination. Air is insufflated into the rectum at frequent intervals. This assists in identifying the apex of the volvulus and, by expanding the rectal ampulla, helps prevent inadvertent perforation. Occasionally the air pressure itself may reduce the twist. A spiraling identifies the apex of the volvulus of the rectal mucosa, which is often edematous. The tip of a well-lubricated #32 rubber rectal tube is pushed gently into the apex of the spiral and advanced into the obstructed segment. If initial attempts are unsuccessful, use a larger, not smaller, diameter tube and apply constant pressure at the apex. Try moving the patient into alternate positions, such as the knee-elbow position, if the patient's condition permits. This allows the colon to fall away and open up the angle of the volvulus. Do not be tempted to push a narrow, rigid probe into the apex, as this will perforate the already compromised bowel wall. If the visibility is poor, place the end of the sigmoidoscope directly on the apex and, without moving the sigmoidoscope, slide the tube up the scope and the tip will then lie at the apex. Never use undue force and never probe blindly. There will be no doubt when decompression has been achieved. A polythene-lined bucket should be on hand to avoid unnecessary spillage from the sudden, forceful rush of gas and liquid stool.

SURGICAL MANAGEMENT

EMERGENCY SURGERY

Indications:

1. Failed sigmoidoscopic decompression

2. Fever and leucocytosis persisting after sigmoidoscopic decompression.

3. Clinical indications suggestive of intestinal ischemia, perforation or peritonitis.

SURGICAL OPTIONS

Resection and primary anastamosis with or without on table colonic lavage

Gurel advocated primary resection and anastamosis in the management of viable sigmoid volvulus together with "on-table" lavage technique. This technique of intra operative anterograde irrigation of the colon allows the large bowel to be prepared intra operatively to be followed by primary resection and anastamosis, and in rare cases with protective colostomy. This procedure has been introduced in 1980 (Dudley et al.,

1980), and according to a study 'On-table lavage in the management of sigmoid volvulus' by Gibney, Beaumont Hospital Dublin, Ireland, this procedure had

since long been in use in some Western countries in the management of certain types of colon carcinoma and diverticular diseases. The advantage of this procedure lies in the fact that it is relatively safer in non-risk patients, and it also avoids a second operation and the risk of recurrence.

HARTMANN'S PROCEDURE

Exteriorization of the proximal colon and closure of the rectal pouch may be necessary if the viability of the bowel beyond the limits of resection is in doubt. Prior perforation of the sigmoid and significant peritoneal soiling would also make this the procedure the operation of choice. A primary anastamosis in this setting carries a high incidence of anastamotic leak.

PAUL-MICKULICZ'S METHOD

It's the "double-barreled" colostomy formation in which the collapsed sigmoid loop is exteriorized through an incision in the left iliac fossa, and the afferent and efferent limbs are opposed and sutured close to the abdominal wall. The redundant loop is then excised outside the abdomen and the ends of the colostomy are sutured to the edges of the skin. This simplifies future closure of the stoma and avoids a second major colostomy closure operation; an advantage over Hartmann's procedure, which requires a second operation and reanastomosis of the bowel, which is often difficult.

The actual treatment at laparotomy depends on whether the colon is gangrenous or not. The frequency of gangrenous colon in industrialized countries is less than 10% compared with rates as high as 25% in developing countries.

LAPAROTOMY FOR SIGMOIDVOLVULUS

The patient is placed in Lloyd Davis stirrups. The marginal loss of elbow-room for the surgeon and his assistants is more than made up for by the ability to pass an EEA stapler per anum, if an unexpectedly low anatomosis is necessary. Both abdomen and perineum are prepared separately in the standard fashion. The perineum remains draped until it becomes necessary to pass the stapling device. Low midline incision is mandatory to provide necessary exposure and reduction of an often enormously dilated sigmoid loop. The first priority is to reduce the volvulus. The sigmoid colon generally twists in an anti-clockwise direction.

GANGRENOUS COLON

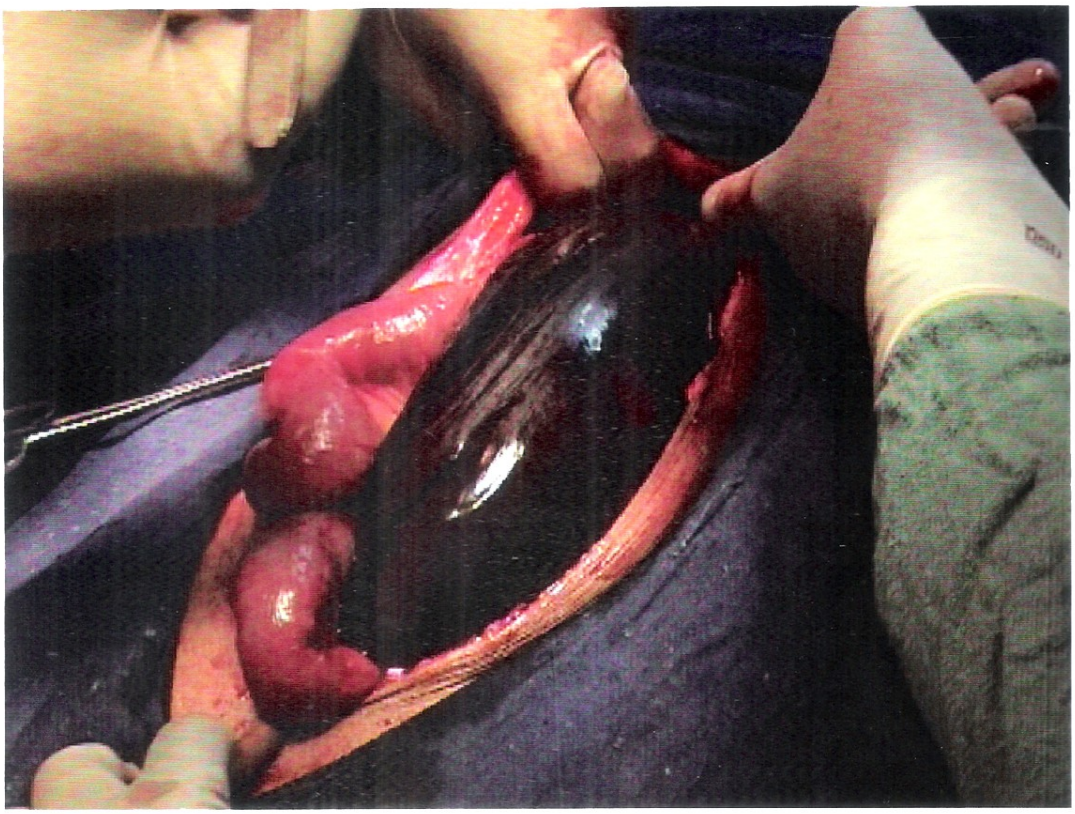
Gangrenous colon requires immediate excision. Untwisting under these circumstances is not advised as this can result in irreversible shock .In the presence of gangrene, resection is followed by a colostomy and mucous fistula or Hartman’s procedure depending on surgeons experience and preference as

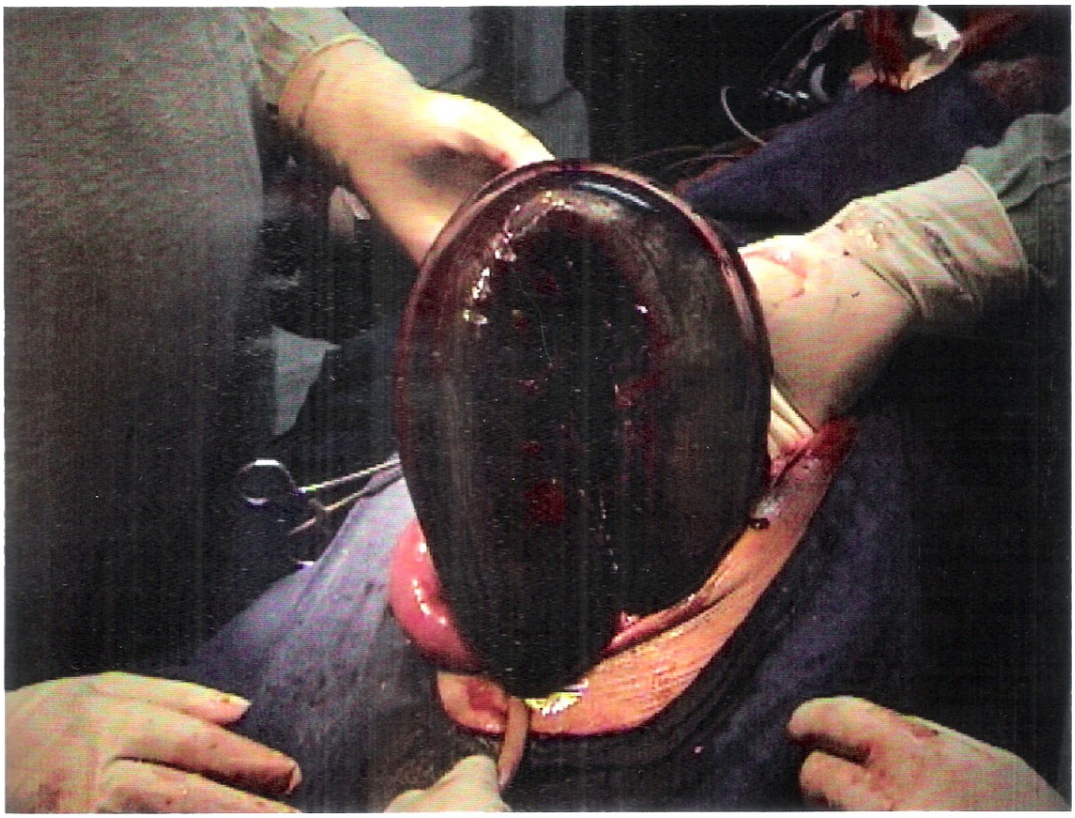
well as whether or not it is possible to bring the distal loop to the skin. This appears the best option, as these patients are often shocked and acidotic.

The mortality rate averages 38% in those with gangrene 8 times higher than when the colon is viable. The effect of the choice of operation remains unclear and there is little evidence that it influences survival. It is in fact likely that the presence of gangrenous bowel was responsible for the high mortality associated with emergency operations, rather than the choice of the surgical procedure.

VIABLE COLON

Viable colon is encountered much more frequently and either resectional or non-resectional procedures may be employed. If sigmoid colon resection is undertaken, opinion varies as to whether intestinal continuity should be restored immediately or later.



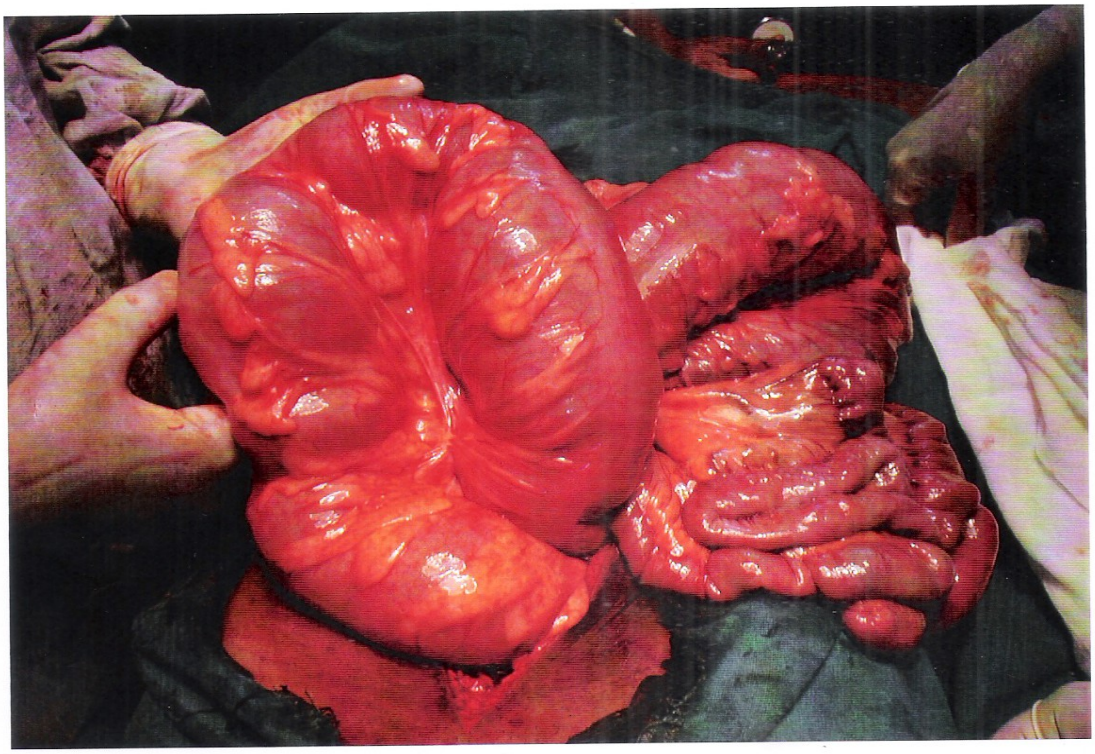


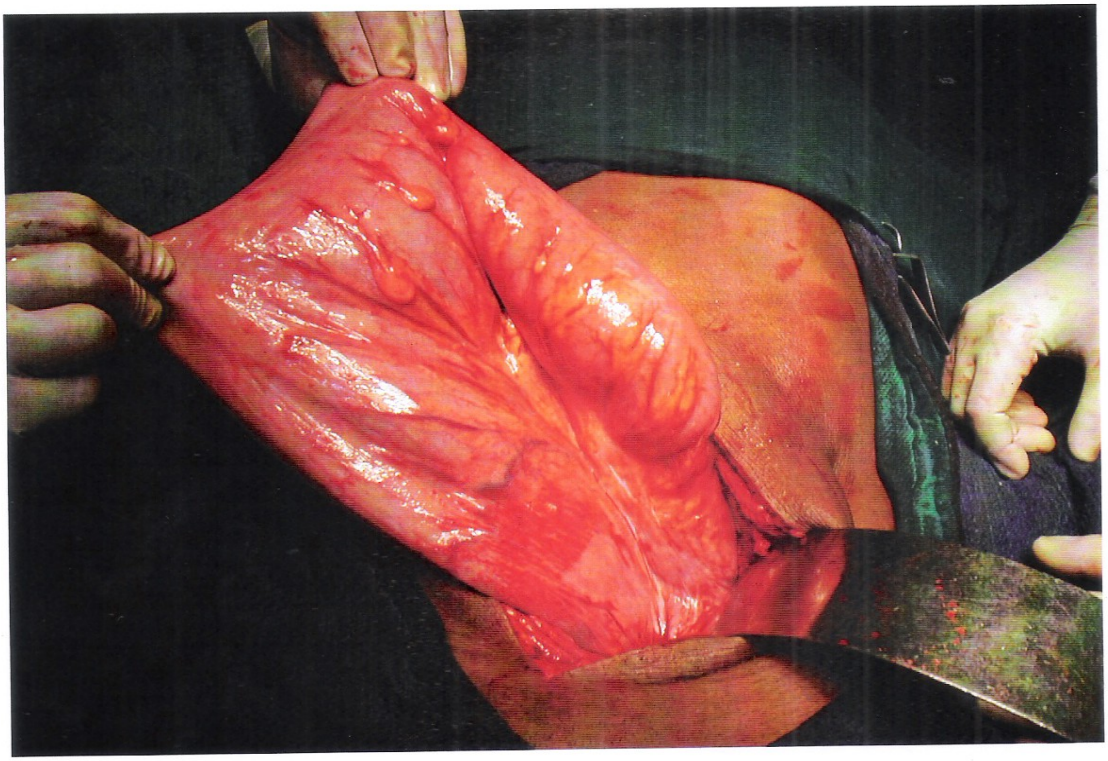
OPERATIVE PICTURE SHOWING GANGRENOUS SIGMOID COLON

A comparison between primary anastamosis and colostomy in various series suggest that mortality varies between 0-33% for primary anastamosis and 0-50% for colostomy. The only evidence that primary anastamosis is a safe option comes from other situations where unprepared bowel is being anastamosed.

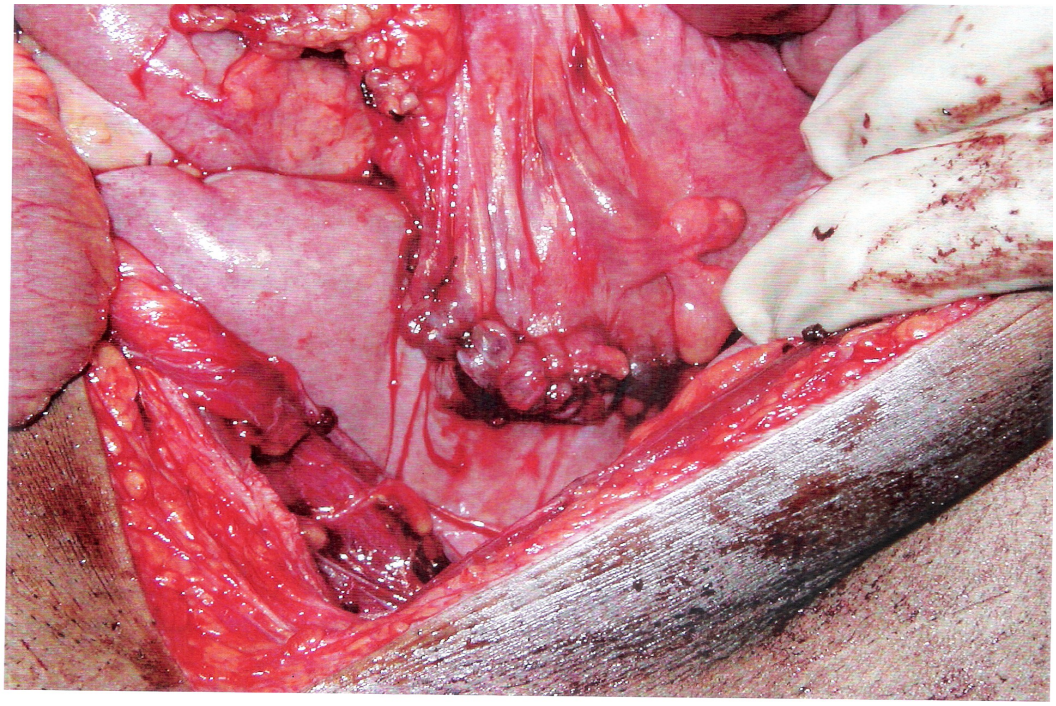
Sule and colleagues (1999) observed that in their series of 27 patients who underwent Resection and primary anastamosis, with on table colonic lavage for sigmoid volvulus had no anastamotic leaks, no mortality and shorter hospital stay.

When resection of viable colon is performed in the emergency situation current evidence from non-volvulus situations favor primary anastamosis rather than a temporary colostomy with a view to restoration of continuity at a later date. Management, however, should be individualized depending on the clinical circumstance and experience of the surgeon.

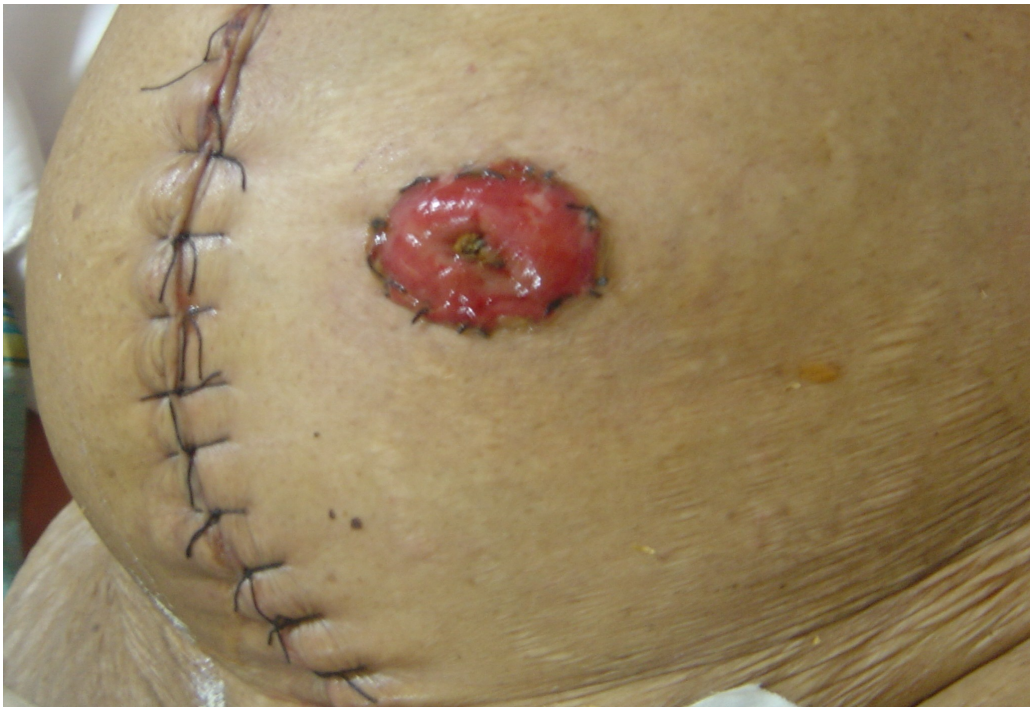




Operative Picture - showing redundant viable sigmoid colon



Operative Picture-showing primary end to side Anastamosis



Operative Picture-showing primary Hartmann's Procedure

ON TABLE COLONIC LAVAGE

Muir first described on-table lavage of the colon in 1968, but the current technique is based on modifications by Dudley and associates. In patients unable to achieve an adequate preoperative preparation, on table lavage reduces the fecal load that is persisting concern in patients considered for primary anastamosis. Lavage also has been shown, experimentally to increase anastamotic and perianastamotic collagen content of the colon. A colostomy is avoided and bowel length preserved, thereby reducing the diarrhea risk of subtotal colectomy. However the procedure necessitates a longer operation, some specialized equipment, and familiarity with the technique. Only those patients with a proximally viable colon, who are able to tolerate the longer anesthetic, should be considered for this procedure.

After mobilization of the sigmoid colon, enteric contents are milked back into the descending colon and noncrushing bowel clamps are applied to the colon distally but above the sit of obstruction. Using care to avoid spillage, one end of a sterile evacuation drain (commonly gas sterilized anesthesia gas evacuation tubing) is inserted into the descending colon and secured with cotton tape. The other end is passed off the field and drained into a floor bag or bucket. Proximally, Foley catheter is inserted into the caecum via an enterotomy or the base of the appendix. Sterile saline via sterile irrigation is flushed through the foley catheter while massaging the bowel to break up solid stool. A total of 10 1

of irrigant may be necessary to achieve clear effluent. Upon completion of the procedure, the irrigation catheter may be removed and colon over sewn or converted into a cecostomy for postoperative radiographic study of the anastamosis. Converting an ileal catheter into a tube enterostomy has been associated with enteric leakage and sepsis and is not advised. The effluent tube and involved segment of the colon are removed together after milking residual contents distally, and a primary anastamosis is constructed using standard techniques.

Koruth and associates reported a 7% anastamotic leak rate and 13% mortality in 15 patients with on table colonic for distal colonic lesions. In their series, mortality was unrelated to the anastamosis, and they advocated broader use of the technique. Thompson and Carter detected anastamotic leakage in 6 of 122 patients (4.8%) with rectal or recto sigmoid lesions treated with on table lavage, and Pollock and associates reported a 17% operative mortality in 44 patients treated similarly. Radcliff and Dudley had to clinically significant anastamotic leaks(3%) and two deaths in 64 patients

treated with on table lavage for distal colonic or rectal lesions. A number of other studies confirm these findings and suggest that the risk of primary anastamosis after on table lavage is reasonable and comparable to the risks associated with other methods of managing distally obstructing lesions. With

employment of this technique, >80% of all patients presenting with distal large bowel obstruction should be candidates for resection and primary anastamosis.

ELECTIVE SURGERY FOR DECOMPRESSED SIGMOID VOLVULUS

Although non-operative detorsion has been well established as the initial treatment of sigmoid volvulus, controversy still remains as to whether elective surgery should be resectional or non-resectional. Preoperative deflation allows surgery to be scheduled for the next available list. Although some authors suggest a delay of four weeks before definitive surgery, most do not as many fail to return for elective operation and may present later with severe disease, which may be fatal.

Traditional opinion is that resection of atleast the sigmoid colon is mandatory as lesser procedures have a high incidence of recurrence. If sigmoid volvulus is associated with megacolon, however, total colectomy or subtotal colectomy is advised, as the condition is not cured by sigmoidectomy alone. However in the elderly debilitated patient, extension of colonic resection beyond sigmoidectomy may be inappropriate because of its magnitude and resultant increased stool frequency

Resection: Sigmoid Colectomy

This provides the simplest approach and has the lowest rates of re-volvulus.

How Much To Resect?

As a result of foreshortening of the mesentry, the peritoneal reflection of the rectum and the descending colon are brought into close proximity. Recurrence rates are lowest after resections.

The inferior mesenteric artery is divided at its most accessible location, since this is a benign disease process. The remaining blood supply is divided up to the edge of the colon, so as not to compromise viability of the suture line. The sites of transection are chosen to allow a well-perfused , tension- free anastomosis.

LAPAROSCOPIC SURGERY FOR SIGMOID VOLVULUS

The role of laparoscopic surgery for sigmoid volvulus is not yet defined. Since the abdomen is often already massively distended during the acute stages of the volvulus, laparoscopic procedures are impractical. After successful sigmoidoscopic decompression, stabilization of the patient and adequate bowel prep, elective resection of the sigmoid colon may have a role. Two factors make this procedure an attractive adjunct to the surgical armamentarium. First, the patients are generally elderly and debilitated and would potentially benefit to a large degree from minimally invasive surgery. Second, the long sigmoid

mesocolon seen in sigmoid volvulus lends itself to easy laparoscopic mobilization of the redundant omega loop. Furthermore, the base of the mesocolon is foreshortened, so the proximal and distal ends of the colon are easily brought together, so facilitating a stapled primary anastamosis. Two techniques can be used for elective laparoscopic-assisted sigmoid resection in patients in whom the volvulus has been non-operatively reduced.

Laparoscopic-assisted Sigmoid Resection with a Side-to-side Functional End-to-end Anastomosis

In patients that have severe scarring of the root of the sigmoid mesentery from chronic meso-sigmoiditis, intracorporeal division of the sigmoid vessels is difficult. In addition, long redundant sigmoid colon makes exposure of these vessels problematic. In these patients, a modification of the Paul-Mickulicz's resection is easily accomplished.

The patient undergoes a standard mechanical and antibiotic bowel preparation. In the operating room, the patient is placed in a supine position with legs supported by Lloyd-Davies stirrups. The lower legs are rapped with pneumatic compression boots. After induction of general endo-tracheal anesthesia, a nasogastric tube and urinary catheter are inserted. The abdomen is prepared and draped in a sterile fashion. The patient is dropped into deep Trendelenberg position. A carbon dioxide pneumoperitoneum is established with a Veress needle inserted in a supraumblical position. The Veress needle is

replaced with a 10mm trocar. The abdomen is inspected with 10mm 0 degree laparoscope. Four additional 10 mm trocars are inserted: two in the right lower quadrant and two in the left lower quadrant.

The small bowel is pulled out of the pelvis with grasping instruments. The deep Trendelenberg position causes the small bowel to roll up towards the diaphragm. From the right side of the patient, the assistant surgeon inserts two Endo-Babcockstm (United States Surgical Corporation, Norwolk,CT) and graps the distal sigmoid colon and proximal rectum. He retracts them medially and anteriorly. This exposes the left iliac vessels and the root of the sigmoid mesentry. If the adhesions are scant or moderate in density, the rectum and distal sigmoid mesentry are divided intra- corporeally and an end-to-end anastomosis is constructed. If the mesosigmoiditis is severe, the resection is accomplished extra-corporeally.

In patients with dense adhesions, the rectosigmoid and descending colon are mobilized. The surgeon, on the left side of the patient, uses Endo-Shearstm (United States Surgical Corporation, Norwalk,CT) and a grasping instrument to incise the retroperitoneum. The left ureter is exposed. The retroperitoneal incision is extended down the left side of the pelvis and then up the left gutter. The rectum, sigmoid and descending colon are bluntly swept medially using the shafts of the Ento-Shearstm. The rectum and descending colon are mobilized enough that they can be pulled up to the abdominal wall for construction of an extra-corporeal anastomosis.

The surgeon and assistant surgeon trade sides. The retroperitoneum of the sacral promontory is incised with electro-cautery scissors. This gives the retrosigmoid additional mobility. Dissection is continued until the rectosigmoid can be elevated easily upto the planned site of incision in the left lower quadrant.

An Endo-Babcocktm is inserted through the caudad trocar in the left lower quadrant and used to grasp the apex of the sigmoid loop. The trocar is pulled out of the abdominal wall over the shaft of the Babcock. A transverse incision about 1.5inches in length is made through the trocar site. The apex of the sigmoid colon and then the entire sigmoid loop is pulled through the incision.

Two enterotomies are made in the antimesenteric sides of the proximal rectum and the distal descending colon. A GIA 60tm (United States Surgical Corporation) is inserted through the enterotomies and used to construct a side-to-side, functional end-to-end anastamosis. The staple line is inspected for hemorrhage. The edges of the enterotomy are apposed with Allis clamps and closed with TA 90tm (United State Surgical Corporation) stapling device. The sigmoid mesentery is included within the staple line. Thus, firing the stapling device both closes the enterotomy and ligates the sigmoid mesentery. Care is taken that the inferior mesenteric vessels are not injured. This will ensure an excellent blood supply for the colorectal anastamosis. The sigmoid colon and

sigmoid mesentery are resected and handed off the field. The specimen is opened within the operation room by a surgical pathologist.

The anastamosis is dropped back into the abdomen. The abdomen is liberally irrigated through the incision with warmed saline. This facilitates removal of any clots, which have accumulated within the operative field. The incision is closed with interrupted sutures. The pneumoperitoneum is re-inflated. The anastamosis is scrutinized. The colon is traced proximally to make sure that a volvulus was not generated during construction of the anastamosis. A colonoscope is passed transanally to examine the anastamosis. The colon is insufflated and checked for evidence of leaks.

The trocars are removed one at a time. The fascial defects are closed with interrupted sutures. The skin edges are apposed with skin staples. Band-Aids (Johnson & Johnson, Inc.) are applied over the wound.

Laparoscopic Sigmoid Resection with End-to-End Anastamosis

In patients with little scarring of the sigmoid mesentery, a more standard-type of sigmoid resection can be accomplished. The patient is prepared and positioned as described above. The pneumoperitoneum is insufflated.

Five 10mm trocars are inserted. The retro peritoneum is incised and the Left ureter identified. The proximal rectum, sigmoid and descending colon are mobilized medially. The retro peritoneum on the right is incised over the sacral promontory. The presacral space is entered between the fascia propria and the

retro rectal (Waldeyer's) fascia. The inferiormesentric and superior haemorrhoidal vessels are identified.

The feasibility of exposing the distal sigmoid branches is assessed. The redundancy of the Sigmoid colon and limited space for retraction within the abdominal cavity makes this difficult. If this proves inadequate, an extra-corporeal resection is performed. If visualization is satisfactory, intracorporeal transaction of the proximal rectum and division of the distal sigmoid branches is performed.

The assistant surgeon grasps the proximal rectum on the either side of the planned point of transaction with to Endo-Babcockstm. The caudad 10mm trocar in the right lower quadrant is replaced with a 12 or 15mm trocar. The rectum is transected and closed with multiple applications of the Endo-GIA 30tm (United States Surgical corporation) or a single firing of the Endo-GIA 60tm (United States Surgical corporation). The staple lines are inspected for hemorrhage.

Traction on the two rectal staple lines exposes the proximal rectal and distal sigmoid mesentry. The mesenteric vessels are divided between clips or with serial applications of the Endo-GIA 30tm stapling device using white vascular catridges. The inferior mesenteric and Superior haemorrhoidal vessels are carefully preserved since the blood supply of the anastamosis will be based

on these vessels. Division of the sigmoid branches continues while the exposure is satisfactory.

An Endo-Babcocktm is inserted through the caudad trocar in the left lower quadrant. The trocar is pulled out of the abdominal wall over the shaft of this instrument. A one-inch transverse incision is made through this trocar site. The end of the specimen and then the entire sigmoid colon is pulled through the incision. Any remaining proximal sigmoid vessels are divided between clamps and ligated.

The point of proximal resection is selected. The mesenteric fat is cleared for a distance of one inch around the circumference of the colon at this point. The Automatic purse-string devicetm(United States Surgical corporation) is fired. The colon is transected. The specimen is opened within the operating room. The diameter of the colon is sized. The anvil-shat assembly of the Premium CEEAtm stapling device is inserted into the lumen of the colon. The low profile anvil and modified shaft are used. The modified shaft has an additional groove which facilitates grasping of the shaft with Endo-Bacocktm. The purse-string is tied and the bowel is placed back into the abdomen. The tip of the anvil-shaft assembly is positioned in the pelvis so that it points directly at the rectal stump.

The abdomen is liberally irrigated through the incision. The incision is closed with interrupted sutures. The pneumoperitoneum is re-inflated. The anus is dilated so as to admit four fingers. The head of the CEEAtm is introduced through the anus and advanced up through the rectum. The white trocar tip is screwed out through the previous staple closure of the rectum. It is lassoed with a pre-tied laprascopic ligature and withdrawn out through the 12 or 15 mm trocar. The anvil-shaft assembly is grasped with an Endo-Babcocktm and docked into the orange collar of the cartridge of the Premium CEEAtm stapling device. The CEEAtm is screwed closed and fired. It is removed. The donut-like rings of the anastomosis is inserted through the anus and advanced upto the anastamosis. The colon is insufflated and checked or evidence of air leakage under water.

The trocars are removed and the fascial defects closed. The skin edges are opposed with skin staples. Band-Aidstm covers the wounds.

NON-RESECTIONAL PROCEDURES

A number of non-resectional operations have been described for the management of a viable sigmoid colon, in the emergency as well as in the elective setting.

Colopexy

Colopexy involves suturing the sigmoid colon to the lateral abdominal wall using interrupted sutures. It has the advantage of not requiring resection of the sigmoid colon and, therefore not requiring bowel preparation. It is found out that resection has an average mortality of 21% and average recurrence of 1.2%. For colopexy the average mortality is 11% and the average recurrence is 22%.

Mesosigmoidoplasty

Mesosigmoidoplasty is a procedure where one leaf of the long sigmoid mesocolon is incised longitudinally; the two flaps raised and sutured transversely, thus broadening the attachment. It is a simple operation with a low rate of operative mortality and morbidity. Undue post-operative constipation is not a problem as the sigmoid colon angulations is prevented. Subramanyam's well-documented series of 126 patients with an average follow up of 8.2 years, and a recurrence rate of 1.6% and no mortality. The lack of verification of Subramanyam's results in other surgeons' hands counts against its routine use.

Other non-resectional procedures include,

1. Percutaneous endoscopic colopexy using colonoscopy and a percutaneous endoscopic gastrotomy kit

2. Laparoscopic fixation

3. Extraperitonalisation of the sigmoid colon

4. Mesenteropexy

The paucity of studies addressing non-resectional surgery makes it currently difficult to make recommendations regarding their routine use. Randomized controlled studies are required for resectional and non-resectional options.

SURGICAL MORTALITY

Mortality rates of between 4-50% have been reported, depending on the general condition of the patient and presence of concomitant disease. These factors, as previously discussed, may well be more relevant than the choice of surgical procedure in determining outcome. Emergency resection carries a high mortality rate partly because of the poor general condition of the patient and toxemia from necrosis. If the resected bowel is gangrenous the mortality ranges between 18-75% compared with 4-12% in the case of viable bowel. In a study of 54 patients by Peoples et al (1990), patients who had previous episodes of

volvulus had a lower mortality rate than those treated for their first episode. They also noted that resection for the first episode in patients older than 70 years of age had a high mortality (33%)

Mortality following emergency surgery for acute sigmoid volvulus is higher (36-80%) in the developed than in the developing world (16-33%). This is probably due to patients in the developed world being elderly and frail with poor cardio respiratory reserve. This makes them less able to withstand the disorder and its surgical treatment than those of the developing world, who, despite debilitation resulting from delayed presentation, are usually relatively young and healthy.

PATIENTS AND METHODS

Twenty-five consecutive patients with acute sigmoid volvulus treated over a 3-year period (2006-2008) in Government Royapettah Hospital were retrospectively reviewed. The diagnosis of sigmoid volvulus was made from a history of large bowel obstruction (constipation, abdominal distension, and abdominal pain), which were often recurrent and plain abdominal radiographs. In the latter, the cardinal features were the inverted ‘coffee bean’ or ‘omega’ sign of the distended, twisted, sigmoid colon.

Laparotomy was performed on all patients after active fluid resuscitation, correction of any electrolyte and acid base disturbances, and establishment of satisfactory urine output.Inj.Cefotaxime 1 gm and Inj metronidazole 500 mg were administered intravenously at the time of induction of anesthesia and were continued postoperatively.

At laparotomy, viability of the bowel was assessed through a midline incision. Gaseous distension of the large bowel was relieved by needle aspiration. Depending on the viability of the colon, general condition of the patient and surgeons experience either resection and primary anastamosis or Hartmann’s procedure or sigmoidopexy was done. A Closed tube drain without

suction was inserted in the left flank through a separate stab incision. The vertical; midline incisions were closed by mass closure using monofilament prolene.

The clinical course and postoperative complication were also reviewed. Wound infection was defined as a presence of pus, either discharging spontaneously as requiring drainage. Anastamotic leak was defined as the presence of a fecal fistula or anastamotic breakdown seen at laparotomy following peritonitis. Hospital stay was defined as the total time spent in the hospital for the presenting complaint. Mortality was considered as death occurring in hospital.

RESULTS

The 25 patients comprised of 18 men and 7 women with an age range of 17-76 years. The age-sex distribution is shown in Table 1.

AGE SEX DISTRIBUTION PATTERN

Age	Male	%	Female	%	Total
10-20	1	5.6	1	14.3	2
21-30	2	11.2	1	14.3	3
31-40	7	38.9	1	14.3	8
41-50	2	11.2	1	14.3	3
51-60	4	22.2	1	14.3	5
61-70	1	5.6	2	28.6	3
71-80	1	5.6	0	0	1

The frequency of signs and symptoms of sigmoid volvulus in our series of patients is shown in Table 2.

FREQUENCY OF SIGNS AND SYMPTOMS OF SIGMOID VOLVULUS

SYMPTOMS	FREQUENCY	÷ N=25
Abdominal distension	2.5	100%
Failure to pass stool or flatus	23	92%
Colicky abdominal pain	19	76%
Vomiting	11	44%
Dehydration	10	40%
Shock	3	12%
Blood in stool	2	8%
Rebound tenderness	3	12%

Table 3 shows the frequency of symptoms among volvulus cases in our series of patients

DURATION OF SYMPTOMS AMONG VOVULUS CASES

No. of days	No. of patients	Percentage
1	2	8%
2	4	16%
3	7	28%
4	8	32%
5	2	8%
>5	2	8%
Total	**25**	**100**

The morbidity associated various procedures is shown in Table 4. Superficial wound infection occurred in four patients. All the infected wounds eventually healed with conservative measures. Clinical anastamotic dehiscence was noted in 1 patient for which during relaparotomy proximal colostomy and mucous fistula was done.

MORBIDITY EVALUATION

Procedure	No. of cases	Wound infection	Anastamotic dehiscence
Resection & primary Anastamosis	8	2	1
Hartmann's procedure	11	2	0
Sigmoidopexy	5	0	0

The mortality associated with various procedures is shown is Table 5. There were 6 deaths of which 4 were due to sepsis and 2 were due to co-morbid illness. One out of five patients for whom a colopexy was done had a recurrent attack of sigmoid volvulus. The duration of hospital stay ranged between 10 and 21 days.

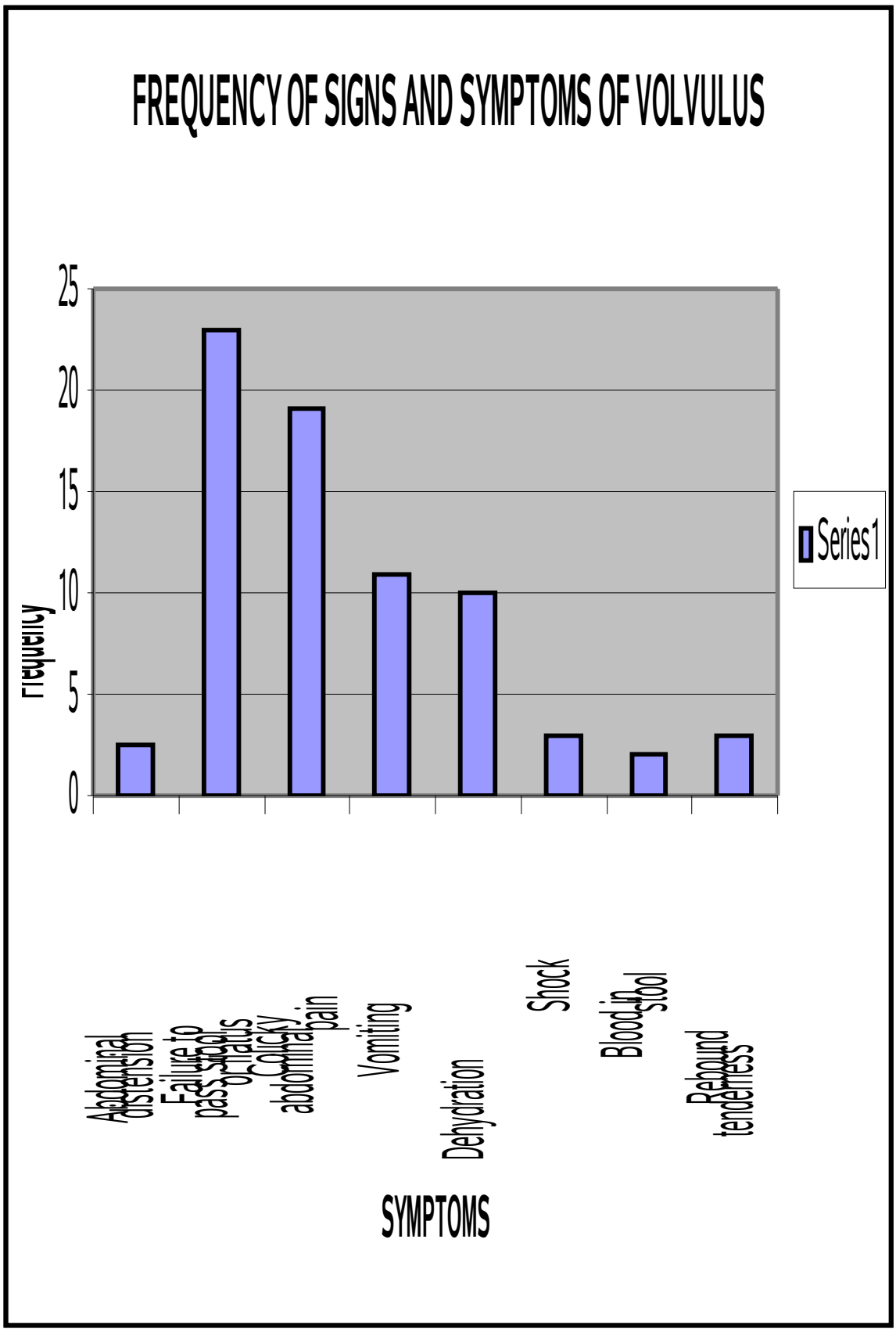
MORTALITY VS TYPE OF PROCEDURE

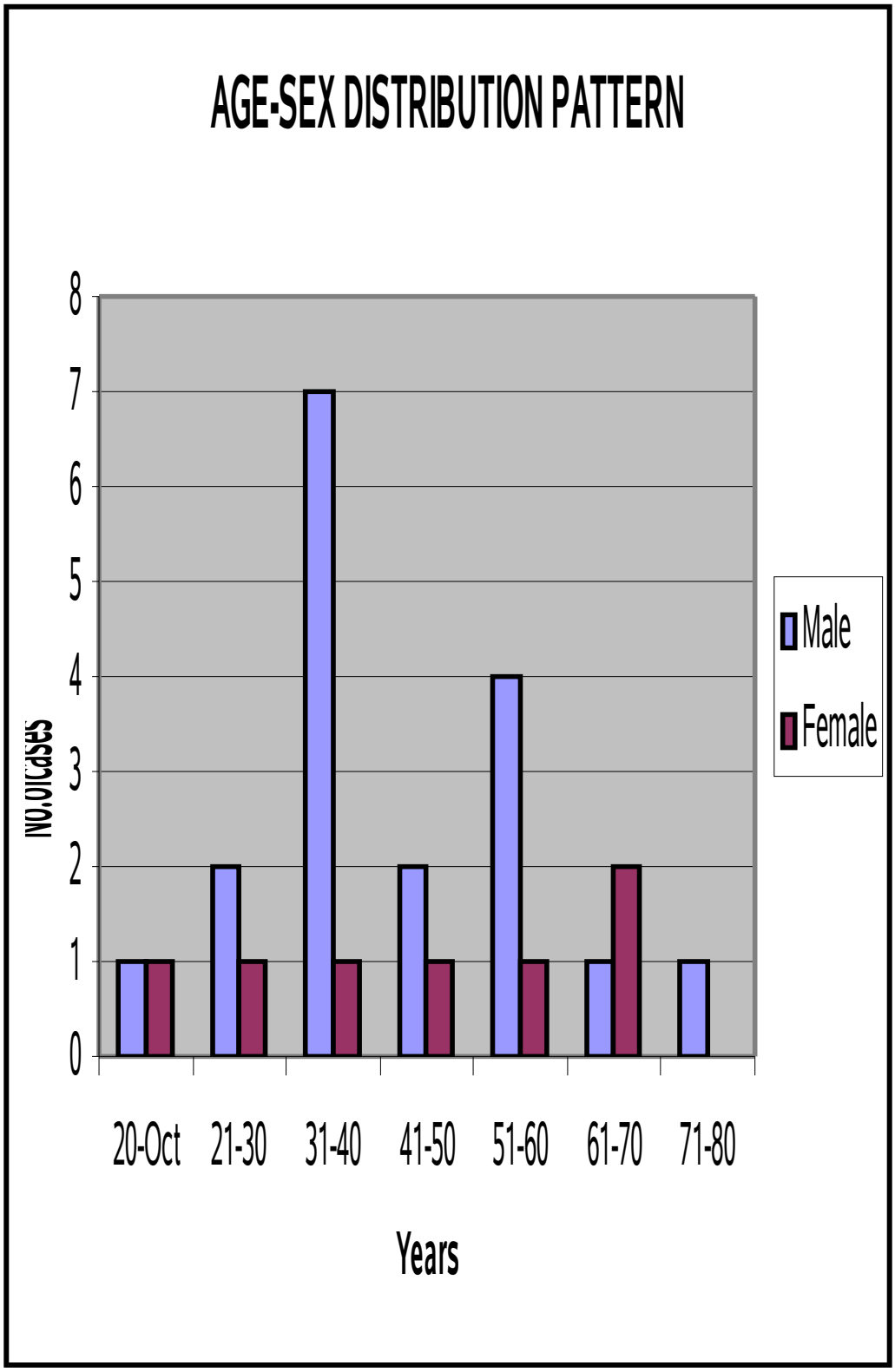
Procedure	**No. of cases**	**Death**	**Mortality %**
Resection & primary Anastamosis	9	3	33.3
Hartmann's procedure	11	2	18.2
Sigmoidopexy	5	1	20

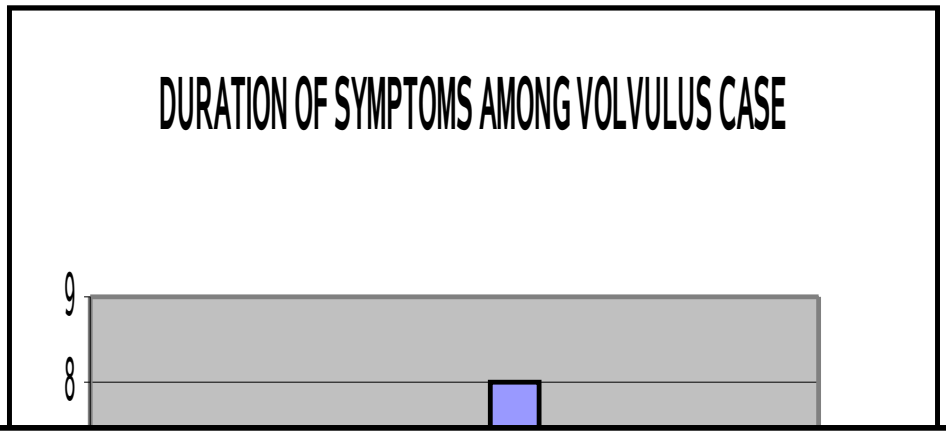
Only 7 of 25 patients had gangrenous bowel. The outcome following emergency resection of sigmoid colon for gangrenous and viable colon is shown in Table 6.

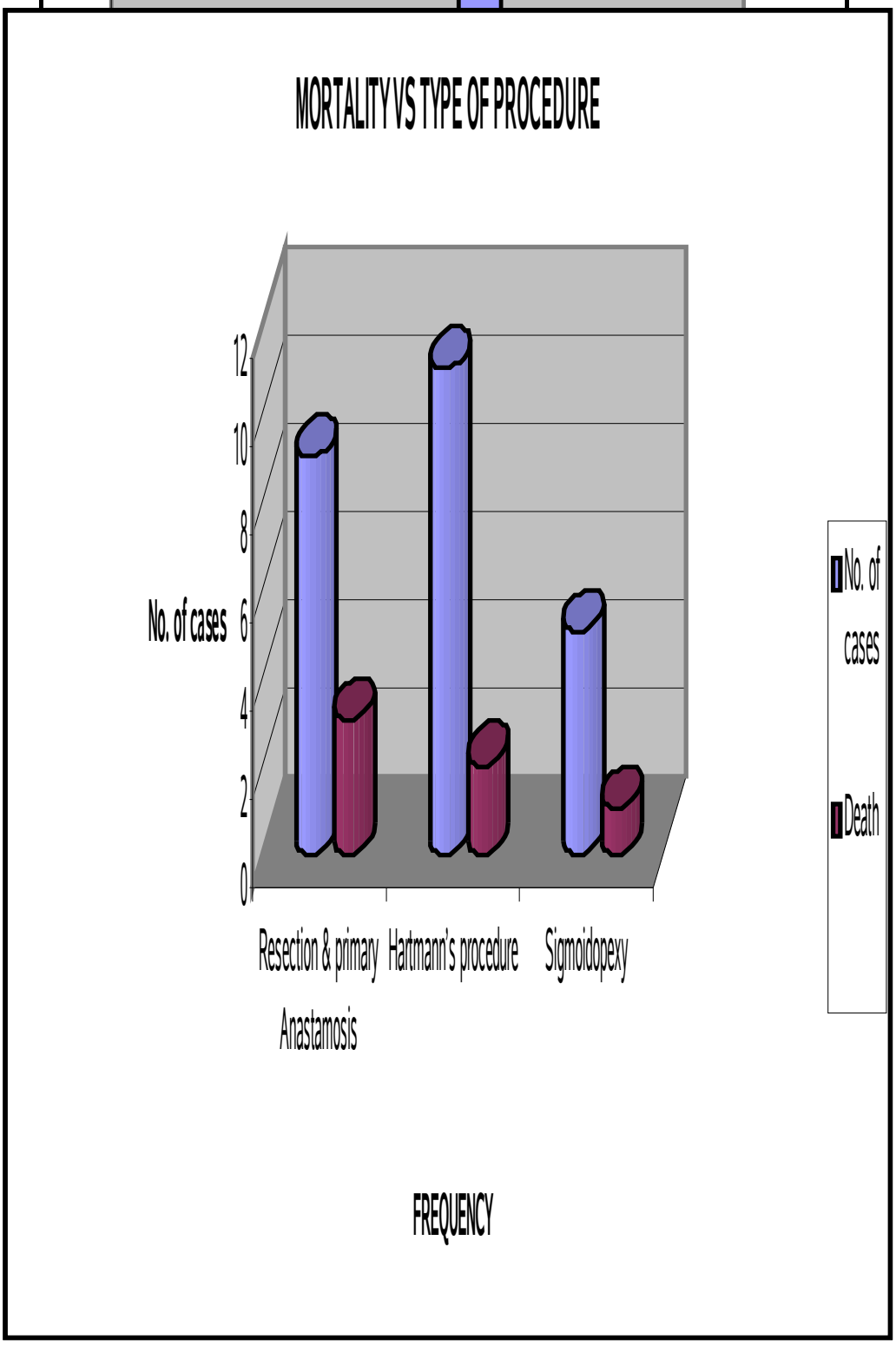
VIABILITY OCOLON VS MORTALITY

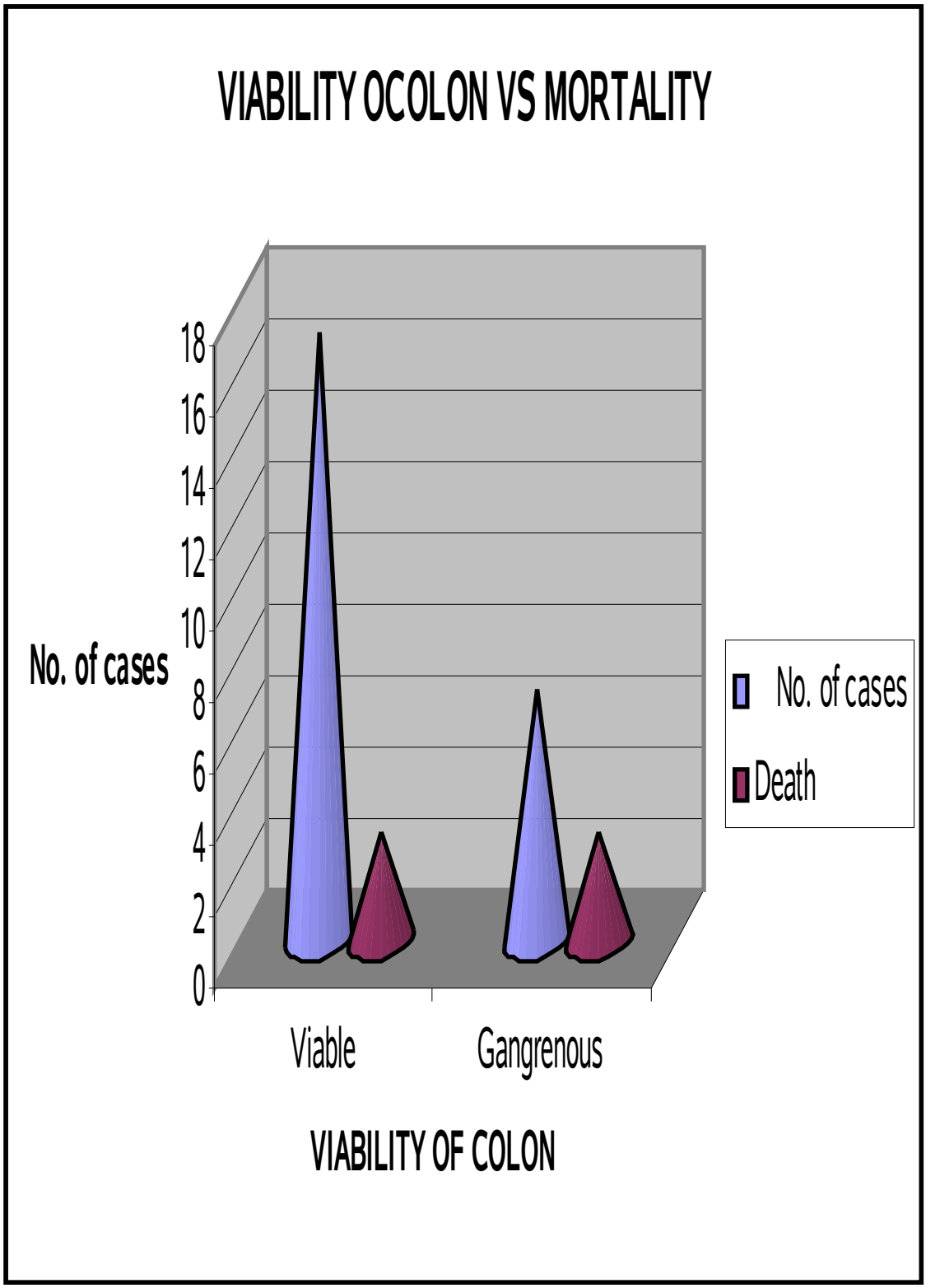
Procedure	No. of cases	Death	Mortality %
Viable	18	3	16.67
Gangrenous	7	3	42.9


FREQUENCY OF SIGNS AND SYMPTOMS OF VOLVULUS
25
20
15
10
5
0
Frequency
Series1
Abdominal distension
Failure to pass stool
Colicky abdominal pain
Vomiting
Dehydration
Shock
Blood in stool
Rebound tenderness
SYMPTOMS


AGE-SEX DISTRIBUTION PATTERN
NO.OF CASES
0
1
2
3
4
5
6
7
8
20-Oct
21-30
31-40
41-50
51-60
61-70
71-80
Years
Male
Female


DURATION OF SYMPTOMS AMONG VOLVULUS CASE
9
8


MORTALITY VS TYPE OF PROCEDURE
No. of cases
12
10
8
6
4
2
0
Resection & primary Anastamosis
Hartmann's procedure
Sigmoidopexy
No. of cases
Death
FREQUENCY


VIABILITY OCOLON VS MORTALITY
No. of cases
18
16
14
12
10
8
6
4
2
0
Viable
Gangrenous
VIABILITY OF COLON
No. of cases
Death

CONCLUSION

1. Use of sigmoidoscopic detorsion for viable colon should be encouraged.

2. Sigmoidopexy, which is associated with a recurrence rate of 20% in our series of patients, should be used selectively.

3. Primary anastamosis in emergency situation can be carried out with morbidity and mortality in patients with viable colon.

4. Hartmann's procedure is a safe option in sigmoid volvulus with gangrenous bowel.

REFERENCES

1. Surgery of colon, Rectum and Anus-Golligher.

2. Surgery of colon, Rectum and Anus-Keighley and Williams.

3. Bailey and love Short practice of Surgery 24th edition.

4. Principles of surgery –schwartz 8th edition.

5. Oxford textbook of surgery- Morris and Malt.

6. Maingot's Texbook of Abdominal operastions- 10th edition.

7. Current surgical therapy- John L.Cameron-7th edition.

8. Madiba TE, Thomson SR, The Management of sigmorid volvulus. J.Roy. Coll.Edinb. 45, April 2000,74-80

9. Sule AZ lya D, Obekpa PO. One stage procedure in the management of. acute sigmoid volvulus. J.Roy.Coll. Edinb. 44 June, 1999,164-6.

10. Bhatnager BN, Sharma CL. Nonresective alternative for the cure of. nongangrenous sigmoid volvulus. Dis colon Rectum 1998; 41:381-8.

11. Choi D, carter R. Endoscopic sigmoidopexy: A sager way treat sigmoid volvulus J.Roy .coll. Edinb. 1998:43:64.

S.No	Name	Age	Sex	IP NO	Procedure	Duration of Symptoms	Morbidity / Mortality	Hospital stay
1	Prakesh	40	M	774013	Hartmann’s procedure	2	Nil	12
2	Faiza	36	F	775929	Primary anastamosis	3	Nil	14
3	Gandhi	56	M	787802	Primary anastamosis	4	Wound infection	16
4	Balaji	17	M	754753	Primary Anastamosis	2	Nil	10
5	Chandra	65	F	768047	Primary anastamosis	3	Death	-
6	Munusamy	76	M	714305	Hartmann’s procedure	5	Nil	16
7	Sridhar	28	M	714985	Hartmann’s procedure	2	Nil	15
8	Chinnapappa	40	F	717934	Primary anastamosis	4	Wound infection	17
9	Senthil	21	M	725061	Sigmoidopexy	1	Nil	10
10	Petchiammal	65	F	727575	Sigmoidopexy	4	Death	-
11	Sivalingam	38	M	737463	Hartmann’s procedure	2	Wound infection	16
12	Balasubramaniam	40	M	721876	Primary anastamosis	4	Death	-
13	Kanagi	45	F	822256	Sigmoidopexy	3	Nil	10
14	Sekar	42	M	89726	Hartmann’s procedure	4	Death	-
15	Srinivasan	60	M	811789	Sigmoidopexy	1	Nil	13
16	Komala	60	F	815752	Hartmann’s procedure	3	Nil	17
17	Dayakar	55	M	84886	Hartmann’s procedure	5	Death	-
18	Hemavathy	20	F	810357	Primary anastamosis	4	Nil	10
19	Raghu	40	M	811982	Hartmann’s procedure	3	Wound infection	21
20	Marimuthu	52	M	818256	Hartmann’s procedure	6	Nil	16
21	Ganambal	25	F	88823	Primary anastamosis	3	Nil	10
22	Kollapan	62	M	812483	Sigmoidopexy	4	Nil	12
23	Madurai	42	M	81142	Hartmann’s procedure	7	Nil	16
24	Kalimuthu	51	M	818427	Hartmann’s procedure	3	Nil	16
25	Rajagopal	57	M	762891	Primary anastamosis	4	Death	